

CLAIMS

1. Apparatus for indicating the departure of a shape of an object from a specified shape, the apparatus comprising radiation means for directing an incident beam of radiation onto the object, and inspecting means for inspecting the final beam after transmission by or reflection from said object, wherein the apparatus is arranged so that the final beam will have a substantially planar wavefront when said object has said specified shape, and said inspecting means is arranged to determine any departure of the wavefront of the final beam from planarity, characterised in that said inspecting means comprises beamsplitting means and detector means wherein the beamsplitting means is arranged to split the final beam into two or more beams and to direct said two or more beams to laterally displaced locations on the detector means.
2. Apparatus according to claim 1 wherein said radiation means is arranged to produce a collimated beam of radiation.
- 15 3. Apparatus according to claim 1 or claim 2 wherein said incident beam of radiation is optical radiation.
4. Apparatus according to any preceding claim wherein at least one additional wavefront shaping means is disposed between the radiation means and the inspecting means.
- 20 5. Apparatus according to claim 4 wherein at least one said additional wavefront shaping means is located between the radiation means and the object.
6. Apparatus according to claim 4 or claim 5 wherein at least one said additional wavefront shaping means is located between the object and the inspecting means.
7. Apparatus according to any one of claims 4 to 6 wherein at least one said 25 additional wavefront shaping means comprises a lens or curved reflector.

8. Apparatus according to any one of claims 4 to 7 wherein at least one said additional wavefront shaping means comprises a diffraction grating or hologram.
9. Apparatus according to any one of claims 4 to 8 wherein at least one said additional wavefront shaping means is provided by a spatial light modulator.
- 5 10. Apparatus according to any preceding claim and including means for adjusting the relative position of the object and a said wavefront shaping means.
11. Apparatus according to any preceding claim comprising a beam splitter between said source and said inspecting means.
12. Apparatus according to any preceding claim wherein the beamsplitting means
10 of said inspecting means comprises at least one of a diffraction grating and hologram.
13. Apparatus according to any one of claims 1 to 11 wherein the beamsplitting means of said inspecting means comprises non-diffractive beamsplitter means for receiving light from two spaced object planes along a common path for transmission to first and second image areas along respective first and second optical paths, and
15 focussing means arranged to bring said first and second object planes into focus in said first and second areas.
14. Apparatus according to any preceding claim wherein the inspecting means is arranged to provide an analysis of the shape, or components of the shape, of the wavefront of the final beam.
- 20 15. Apparatus according to any preceding claim wherein the detector means of the inspecting means comprises a pixelated imaging photosensor.
16. Apparatus according to claim 15 wherein the pixelated imaging photosensor is a charge coupled device (CCD) array.
17. Apparatus for indicating the departure of a shape of an object from a specified
25 shape, the apparatus comprising radiation means for directing an incident beam of radiation onto the object, and inspecting means for inspecting the final beam after

- transmission by or reflection from said object, wherein the apparatus is arranged so that the final beam will have a substantially planar wavefront when said object has said specified shape, and said inspecting means is arranged to determine any departure of the wavefront of the final beam from planarity characterised in that said 5 incident beam of radiation directed onto the object by the radiation means has a non-spherical wavefront.
18. Apparatus according to claim 17 wherein said incident beam of radiation directed onto the object by the radiation means has a substantially planar wavefront.
19. A method of indicating the departure of a shape of an object from a specified 10 shape, the method including the steps of directing an incident beam of radiation onto the object so that that a final beam following transmission by or reflection from said object would have a planar wavefront if the object has said specified shape, and inspecting the final beam for any departure of its wavefront from planarity characterised in that the step of inspecting final beam comprises the step of splitting 15 the final beam into two or more beams and directing said two or more beams to laterally displaced locations on detector.
20. A method according to claim 19 wherein said object is an optical component.
21. A method according to claim 20 wherein said optical component is a window or is of generally laminar form, or comprises a planar reflective surface.
- 20 22. A method according to claim 20 wherein said optical component has optical power, and including the step of providing an additional wavefront shaping means in the radiation path for providing general planarity in said final beam.
23. A method of indicating the departure of a shape of an object from a specified shape, the method including the steps of directing an incident beam of radiation onto 25 the object so that that a final beam following transmission by or reflection from said object would have a planar wavefront if the object has said specified shape, and inspecting the final beam for any departure of its wavefront from planarity

characterised in that the step of directing an incident beam of radiation onto the object comprises the step of directing a beam of radiation having a non-spherical wavefront.